Alkylation and Oxidation Reactions of Arabian Asphaltenes

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Abstract

Infrared and NMR spectroscopy were employed to investigate the structural changes in the Arab heavy and Arab medium asphaltenes following the Friedel-Crafts alkylation and permanganate oxidation reactions. The results provided significant and in-depth information regarding the nature of chemical reactive sites present in asphaltenes. This work gave clear indication that the aromatic C-H group had undergone alkyl substitution reaction in presence of strong Lewis acid $AlCl_3$. The CH_2/CH_3 groups oxidized to carboxylic acids and other carbonyl functional groups during the oxidation process. Since asphaltenes possess long aliphatic chains, condensed aromatic rings, heteroatoms and metals, information obtained from the structural changes during these reaction processes is considered very significant. The combinations of IR and NMR spectroscopy have proven to be very useful tools in assessing the structural changes occurred in the asphaltenes on subjecting to oxidation and alkylation reactions.

(Key words: asphaltenes; alkylation; oxidation)

INTRODUCTION

Asphaltenes are complex materials containing number of different functional groups, molecular structures and fairly broad molecular weight distributions. The composition of asphaltenes has a great significance due to its vital role in determining the crude oil processing and performance-related properties. The tendency of asphaltenes to precipitate during crude oil